MECKLENBURG COUNTY
CodeEnforcement
Land Use and Environmental Services Agency

Electrical Consistency Team **September 12, 2018**

Committed To: **QUALITY INSPECTIONS AND EXCELLENT CUSTOMER SERVICE**

Our Goal is: **FOR ALL STAKEHOLDERS TO HAVE A SUCCESSFUL PROJECT with us and that together we keep people and structures safe and buildings economically viable to serve the needs of our community.**

I. Customer Service Highlight: David Rains

II. Electrical Consistency Question and Answers.

1. I am replacing a pool pump motor on a 20-year old+ pool. There is no bond wire coming from the hand rails in the pool. Do I have to cut the existing concrete around the pool to install a bond to the hand rails?

A. The NCEBC allows that if it was compliant at time of installation it can be repaired or replaced in a like for like manner, provided it does make a less safer installation. However, the requirement of bonding pool pumps goes back further than 20-25 years, and as a result must be bonded at replacement. Furthermore, the NC Amendments require that replacement be installed to meet current code with respect to GFCI devices.

2. Can the intersystem utility bond bar be used for CSST gas pipe bonding? Can I use it for PV systems? What about water pipe bonding? Generators? Second ground rods?

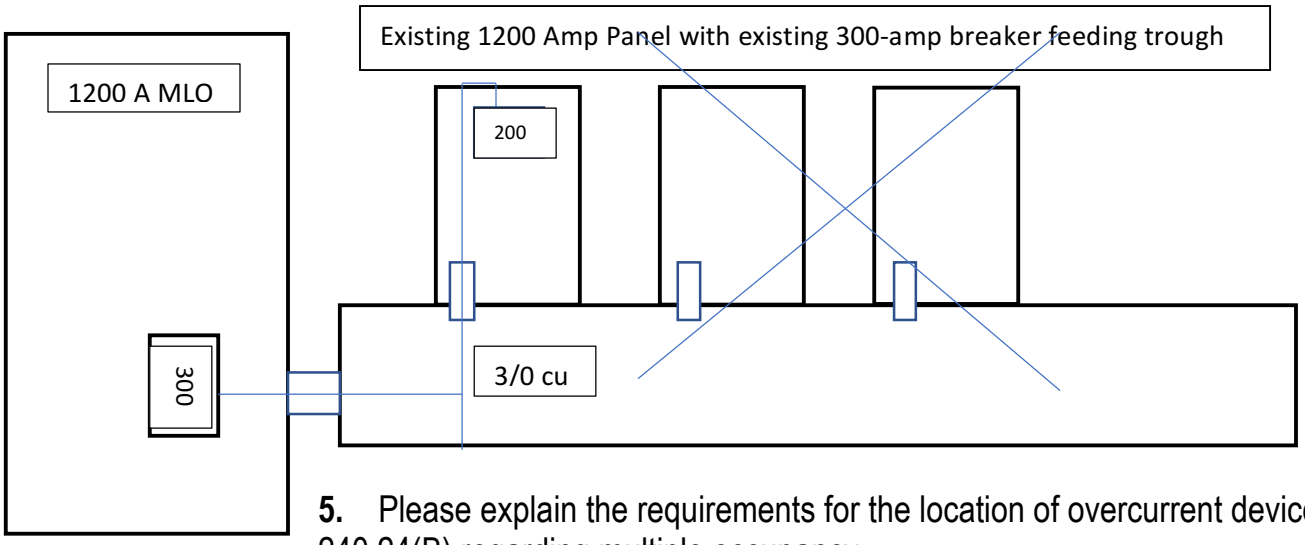
A. The 2017 NEC provided clarification on the intersystem bonding strap to be used just for bonding communication systems, with additions detailed to provide bonding for other systems, along with the intersystem bonding terminations.

3. I have two cables entering a pancake box for a light. The pancake box does not have the cubic inch space for both cables. Can I use the luminaire canopy as additional cubic inch space? (410.20)

A. NEC 410.20 does provide that the canopy along with the box van be used to provide space for conductors. These type boxes do not fit all applications and as a result should be noted on RF if installed with pancake boxes for lighting outlets.

4. Is it permissible to install a tap at the secondary lugs of an over-current device that is larger than the ampacity of the tap conductors?

A. Per 240.21(B) the conductors are taps and no details state the tap cannot originate at the lugs on a larger overcurrent device, therefore can be accepted. However the age of the device played into this scenario and the method provides a better alternative to replacement of the devices.



5. Please explain the requirements for the location of overcurrent devices per 240.24(B) regarding multiple occupancy.

(B) **Occupancy.** Each occupant shall have ready access to all overcurrent devices protecting the conductors supplying that occupancy, unless otherwise permitted in 240.24(B)(1) and (B)(2).

(1) **Service and Feeder Overcurrent Devices.** Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the service overcurrent devices and feeder overcurrent devices supplying more than one occupancy shall be permitted to be accessible only to authorized management personnel in the following:

(1) Multiple-occupancy buildings

(2) Guest rooms or guest suites

(2) **Branch-Circuit Overcurrent Devices.** Where electric service and electrical maintenance are provided by the building management and where these are under continuous building management supervision, the branch-circuit overcurrent devices supplying any guest rooms or guest suites without permanent provisions for cooking shall be permitted to be accessible only to authorized management personnel.

6. How do we size a circuit for a UPS? Example: We have a 25kw 120/208v 3 phase, what would be the min. and max. circuit size?

A. Consult the manufacturer's instructions and the unit nameplate, it must be provided with the required information. If not provided for plan review, the installation will be inspected for compliance in the field.

7. In Plan review what is required for a fire pump? Do we need to see HP, OCP and circuit size or can the designer show a statement showing "wire per manufacturers requirements"?

A. For plan review, we would need the basic system design for the fire pump, including the HP the OCP, and conductor size for normal and emergency power systems.

8. When a designer uses 220.87 to determine an existing load, what is he required to show on the drawing as verification that he has met all the requirements?

A. The engineer must provide a statement verifying the existing load has been calculated per 220.87

9. Does 210.25(B) prohibit extending a branch circuit from one tenant space to another if fed from a common area panel with ready access? If not is there another code article that does?

210.25 Branch Circuits in Buildings with More Than One Occupancy.

(A) **Dwelling Unit Branch Circuits.** Branch circuits in each dwelling unit shall supply only loads within that dwelling unit or loads associated only with that dwelling unit.

(B) **Common Area Branch Circuits.** Branch circuits installed for the purpose of lighting, central alarm, signal, communications, or other purposes for public or common areas of a two-family dwelling, a multifamily dwelling, or a multi-occupancy building shall not be supplied from equipment that supplies an individual dwelling unit or tenant space.

In addition to prohibiting branch circuits from feeding more than one dwelling unit, 210.25 also prohibits an individual dwelling unit branch circuit from supplying shared systems, equipment, or common lighting. Common area circuits in occupancies other than dwelling units are subject to this requirement. "House load" branch circuits must be supplied from equipment that does not directly supply branch circuits for an individual occupancy or tenant space. This requirement permits access to the branch-circuit disconnecting means without the need to enter the space of any tenants. The requirement also prevents a tenant from turning off important circuits that may affect other tenants.

10. Are built in bench seats in a dining/breakfast nook looked at as wall space? What if it is a window seat, typically in a dormer?

A. In the past we have not looked at these as wall space and as a break in the wall space as built in cabinetry per 210.52(A)(2)(1).

11. Can we discuss the changes to 210.52(c)(3) regarding placement of receptacles on a peninsula?

(3) Peninsular Countertop Spaces. At least one receptacle outlet shall be installed at each peninsular countertop long dimension space with a long dimension of 600 mm (24 in.) or greater and a short dimension of 300 mm (12 in.) or greater. A peninsular countertop is measured from the connected perpendicular wall.

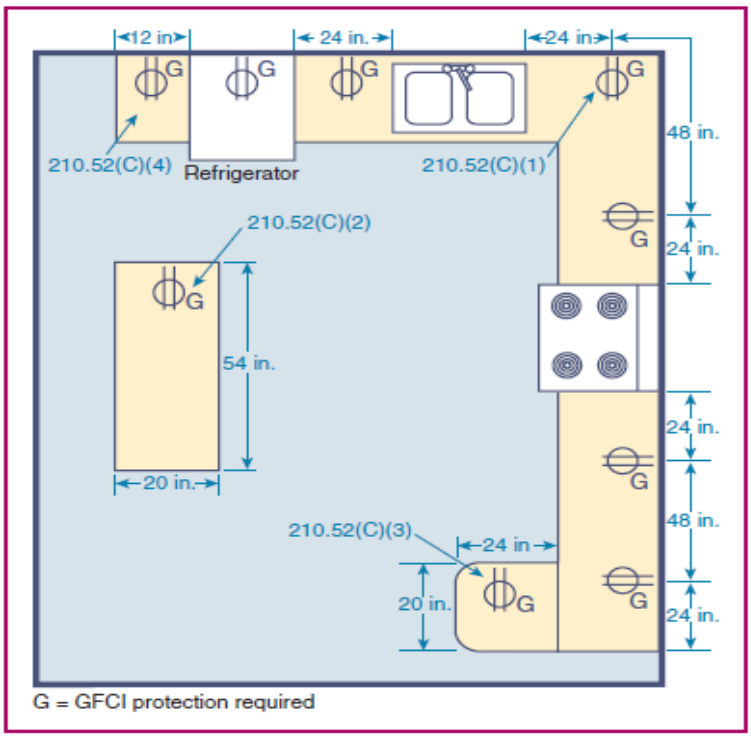


EXHIBIT 210.28 *Dwelling unit receptacles serving countertop spaces in a kitchen and arranged in accordance with 210.52(C)(1) through (C)(4).*

NCDOI Interpretation

Dwelling Kitchen Peninsular Required Receptacle(s)

Code: 2017 Electrical Code **Date:** June 12, 2018

Section: 210.52(C)(3)

Question 1:

Where must the required 125-volt, 20-amp receptacle for a dwelling kitchen peninsular be located?

Answer 1:

Any 125-volt, 20-amp receptacle that meets the criteria described in section 210.52(C)(5) with respect to the dwelling kitchen peninsular has met the requirement for section 210.52(C)(3).

Question 2:

Considering that the peninsular countertop is measured from the connected perpendicular wall, is the area located above the peninsular countertop on the connected perpendicular wall and not more than 20 inches above the peninsular countertop required to meet the wall countertop requirements for section 210.52(C)(1)?

Answer 2:

No. The area of wall not more than 20 inches above any countertop is either wall countertop space described in section 210.52(C)(1) or peninsular countertop space as described in section 210.52(C)(3). Therefore, the area located above the peninsular countertop on the connected perpendicular wall and not more than 20 inches above the peninsular countertop is not required to meet the wall countertop requirements for section 210.52(C)(1).

Question 3:

If a 125-volt, 20-amp receptacle is located on the wall above where the peninsular connects and not more than 20 inches above the peninsular counter top, can that receptacle satisfy both requirements for section 210.52(C)(1) and section 210.52(C)(3)?

Answer 3:

Yes. The area of wall above the kitchen wall countertop(s) and the area of wall above the kitchen peninsular countertop(s) are all “countertops” under section 210.52(C). Therefore, if a 125-volt, 20-amp receptacle meets the criteria described in section 210.52(C)(5) with respect to both section 210.52(C)(1) and section 210.52(C)(3) simultaneously, then the requirements of both section 210.52(C)(1) and section 210.52(C)(3) have been met.

Question 4:

How can a kitchen peninsular be distinguished from a free standing bar-type counter?

Answer 4:

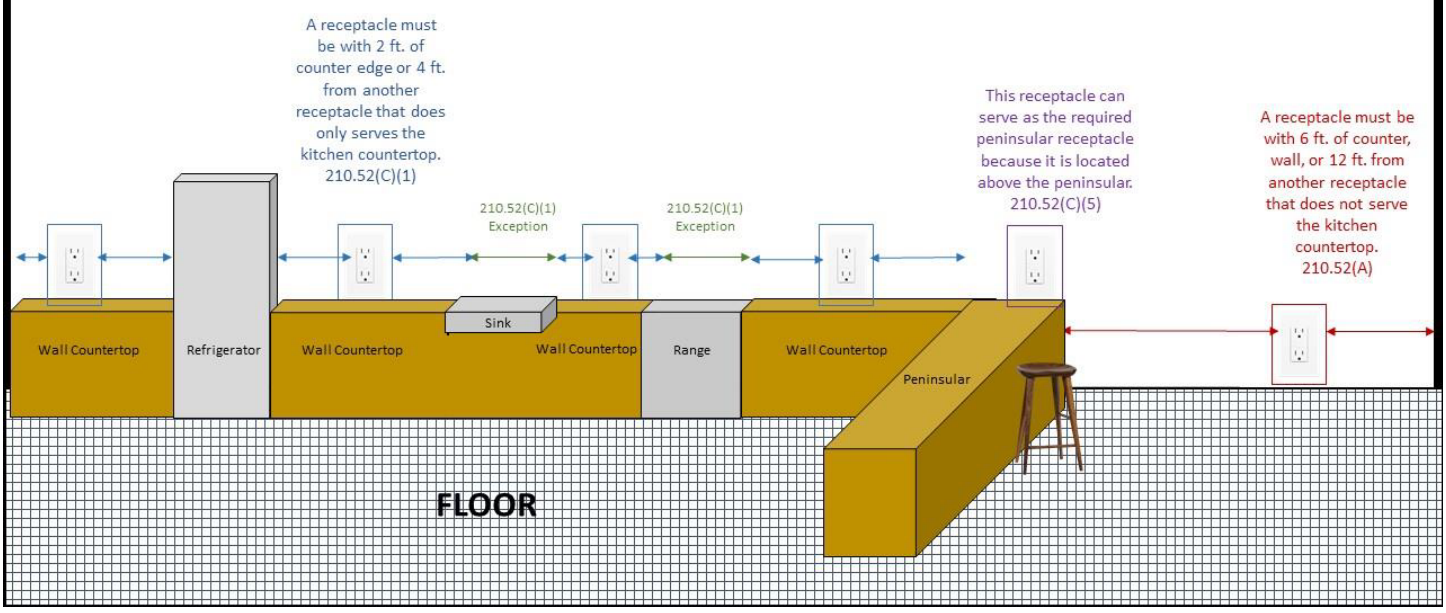
A kitchen peninsular does not have a backsplash.

Question 1 Illustration (a)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

KITCHEN & SIMILAR AREA

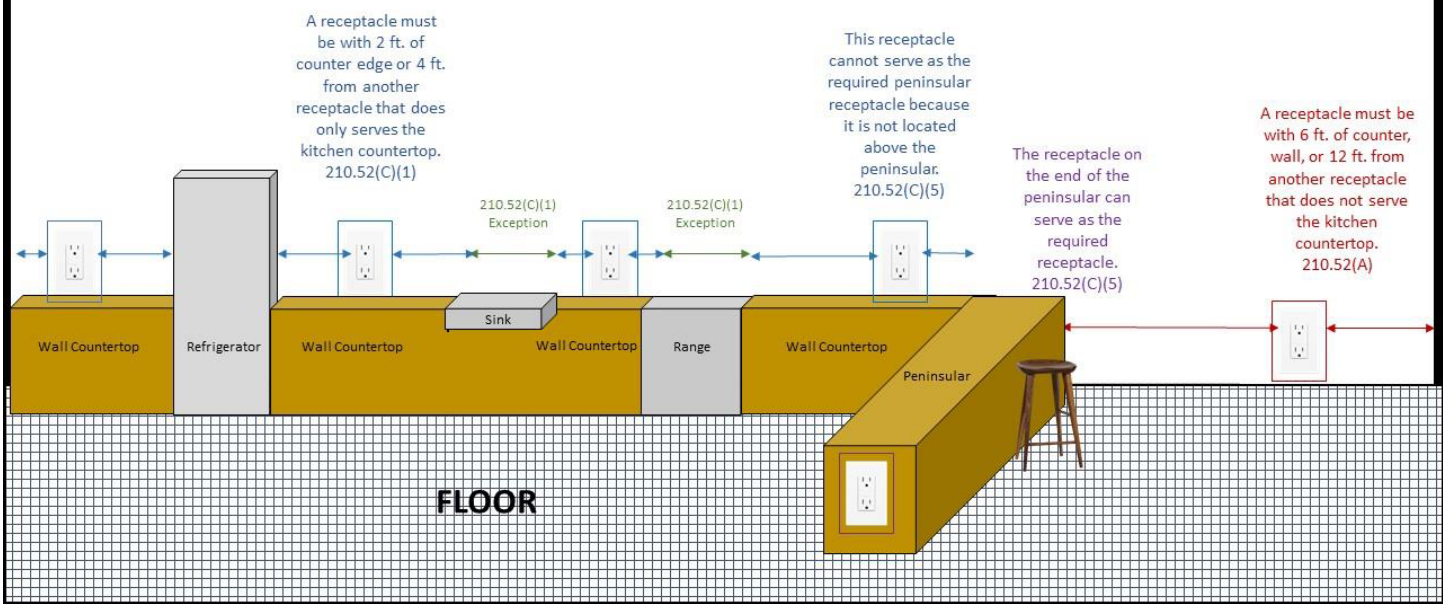


Question 1 Illustration (b)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

KITCHEN & SIMILAR AREA

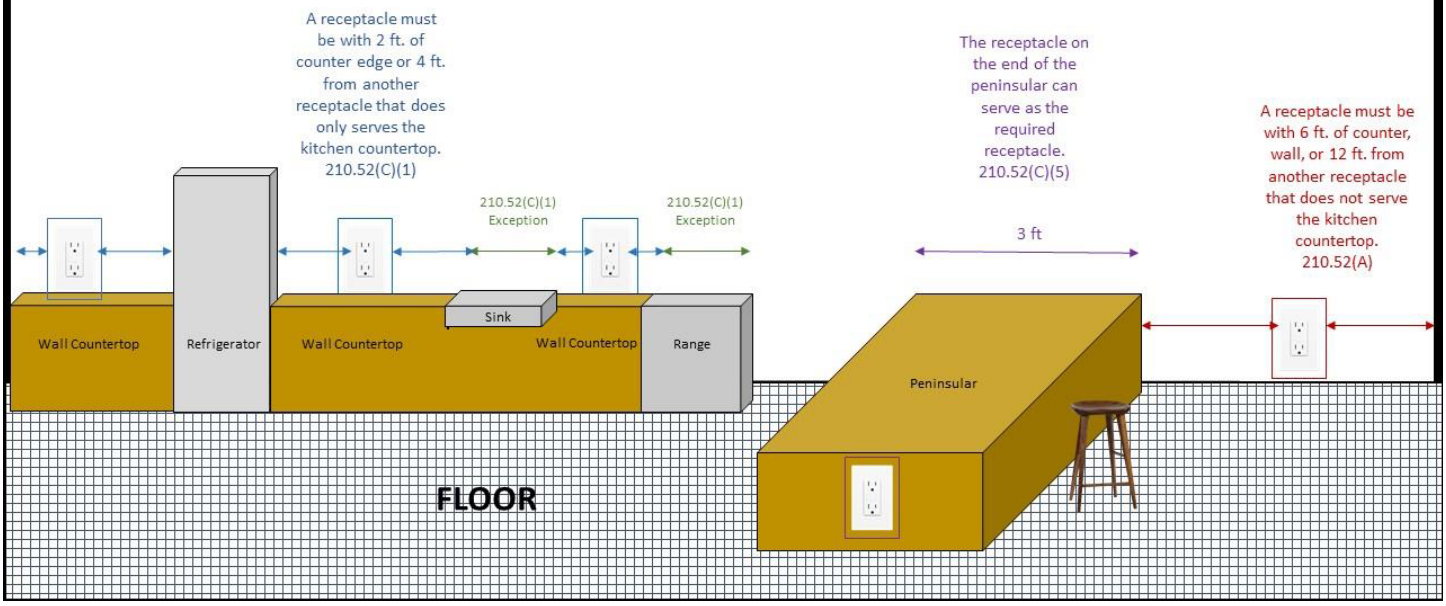


Question 1 Illustration (c)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

KITCHEN & SIMILAR AREA

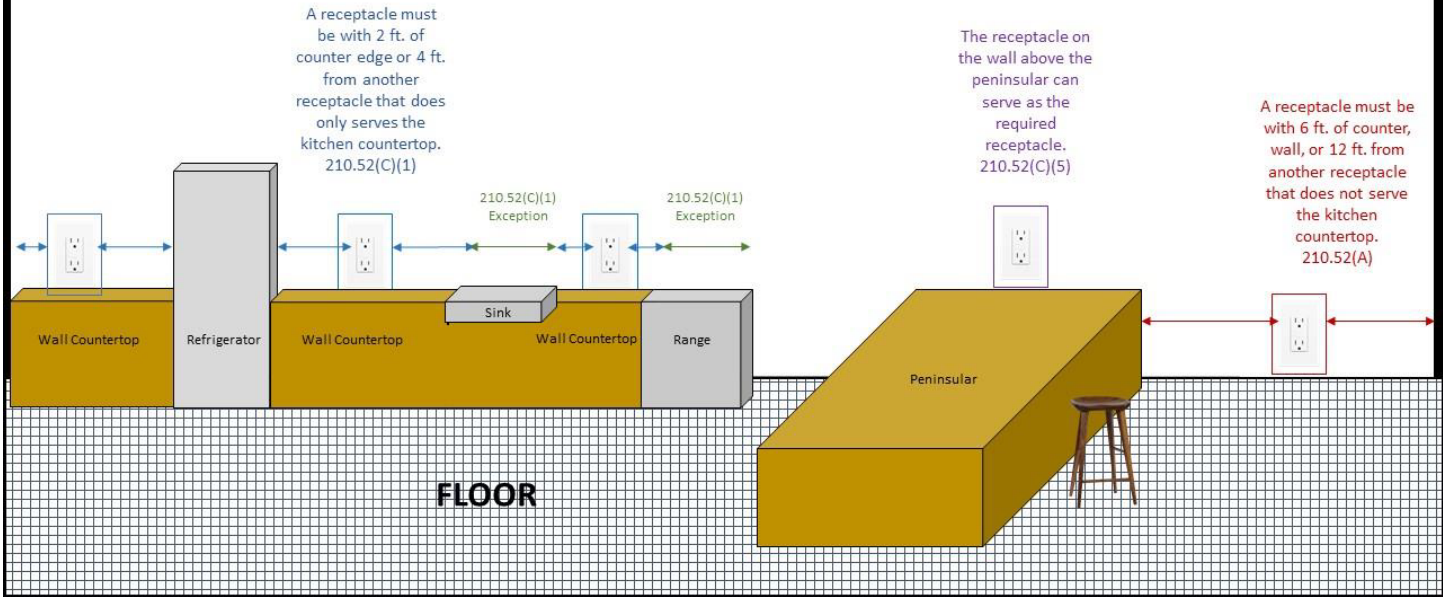


Question 1 Illustration (d)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

KITCHEN & SIMILAR AREA

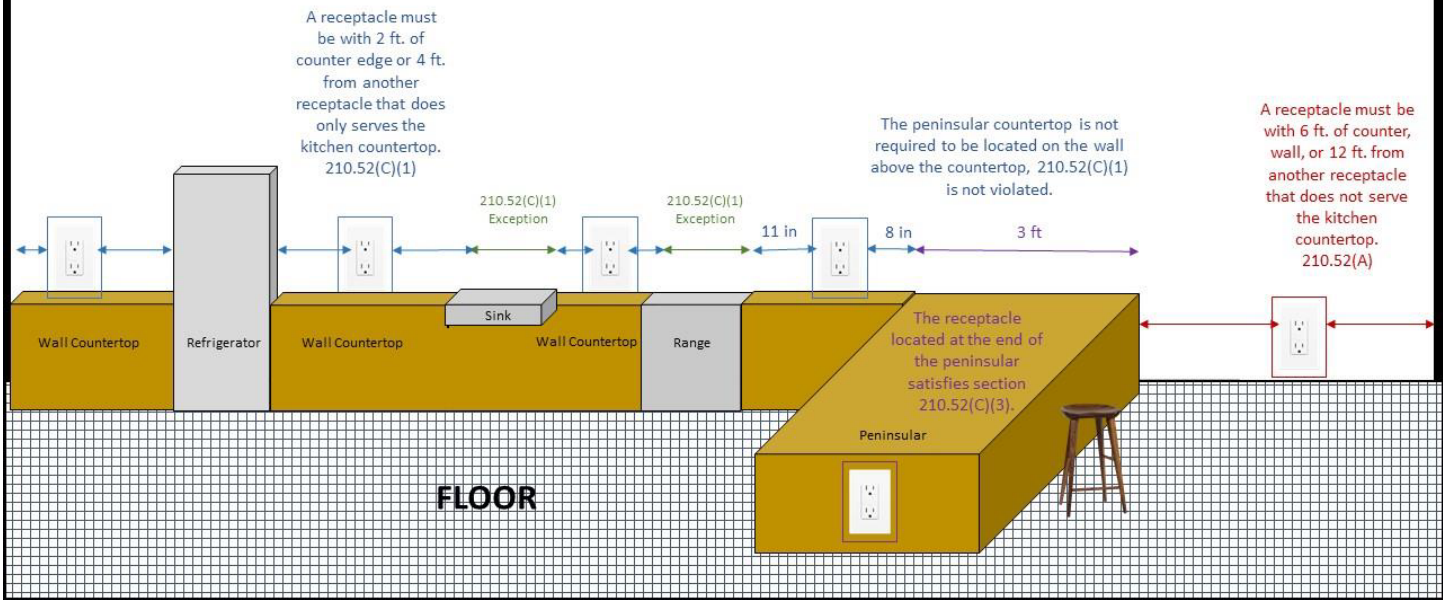


Question 2 Illustration (a)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

KITCHEN & SIMILAR AREA

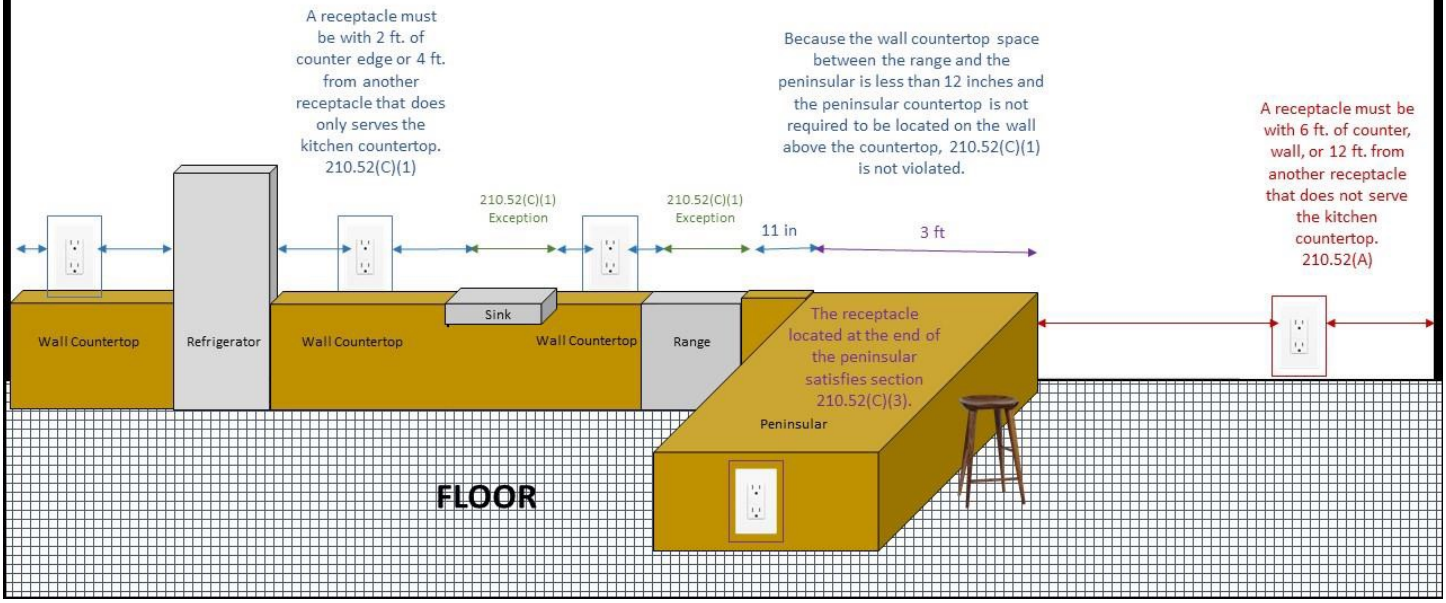


Question 2 Illustration (b)

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop

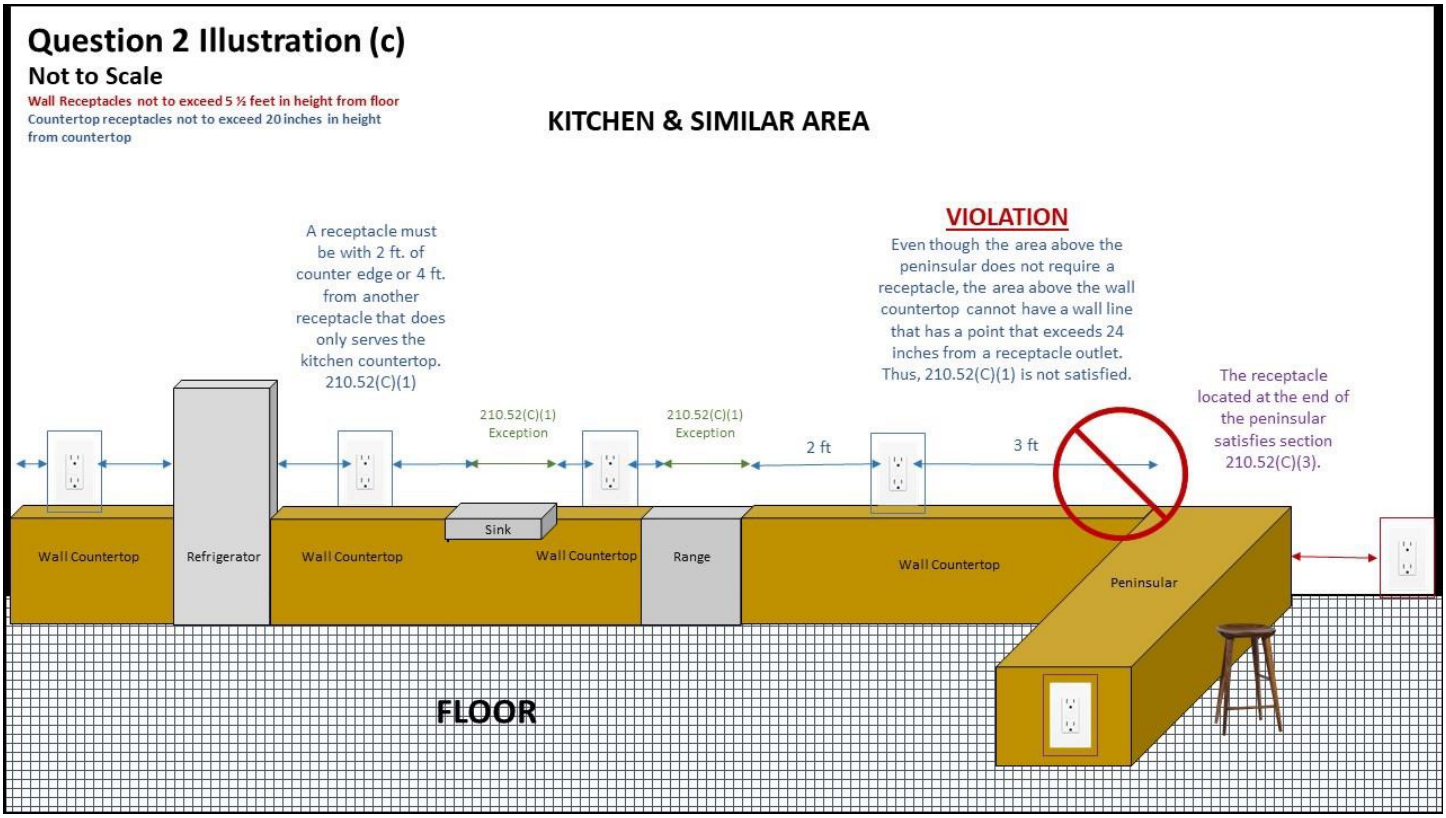
KITCHEN & SIMILAR AREA



Question 2 Illustration (c)

Not to Scale

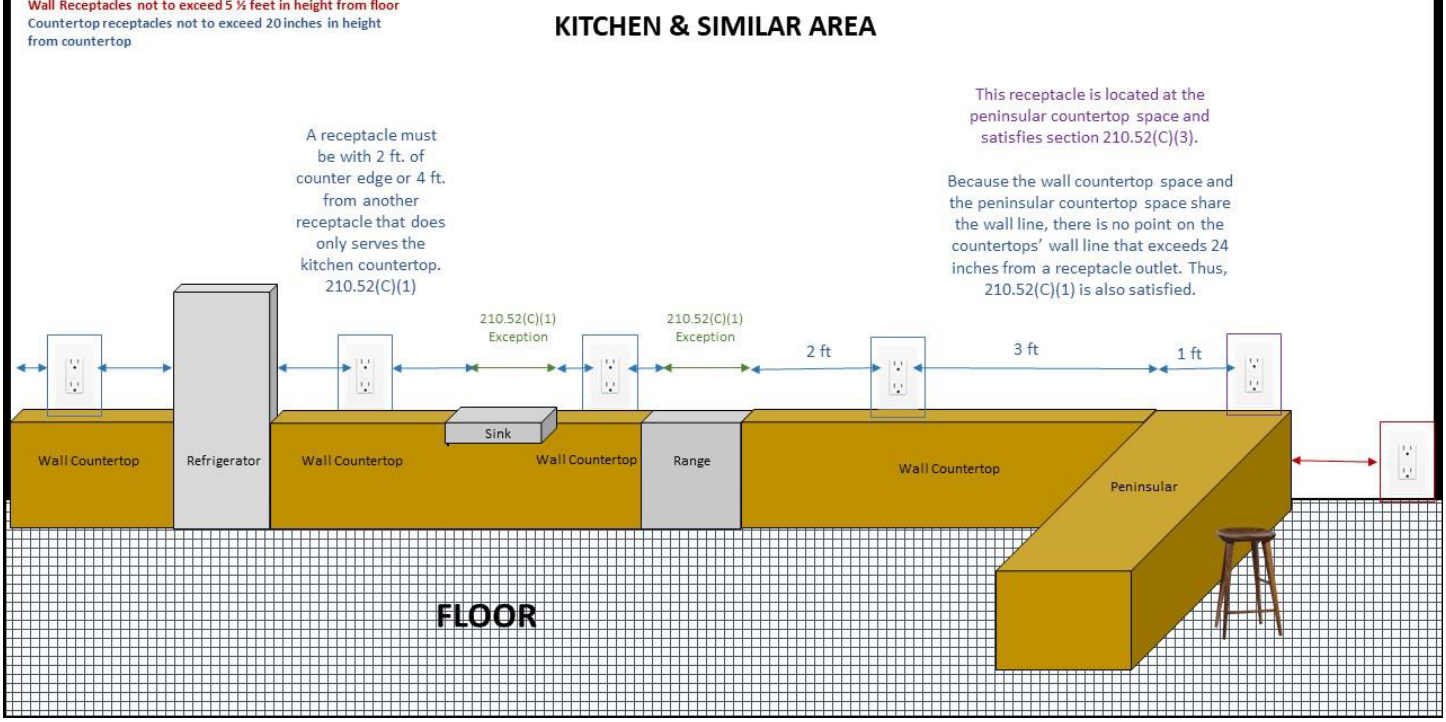
Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop



Question 3 Illustration

Not to Scale

Wall Receptacles not to exceed 5 ½ feet in height from floor
Countertop receptacles not to exceed 20 inches in height from countertop



12. I was recently failed for not installing a bonding bushing on a 208V disconnect where I was using the conduit for my ground. Is this correct? Discuss

250.97 Bonding for Over 250 Volts. For circuits of over 250 volts to ground, the electrical continuity of metal raceways and cables with metal sheaths that contain any conductor other than service conductors shall be ensured by one or more of the methods specified for services in 250.92(B), except for (B)(1).

Exception: Where oversized, concentric, or eccentric knockouts are not encountered, or where a box or enclosure with concentric or eccentric knockouts is listed to provide a reliable bonding connection, the following methods shall be permitted:

(1) Threadless couplings and connectors for cables with metal sheaths

(2) Two locknuts, on rigid metal conduit or intermediate metal conduit, one inside and one outside of boxes and cabinets

(3) Fittings with shoulders that seat firmly against the box or cabinet, such as electrical metallic tubing connectors, flexible metal conduit connectors, and cable connectors, with one locknut on the inside of boxes and cabinets

(4) Listed fittings

Bonding around pre-punched concentric or eccentric knockouts is not required if the enclosure containing the knockouts is listed as suitable for bonding. Fittings, such as EMT connectors, cable connectors, and similar fittings

with shoulders that seat firmly against the metal of a box or cabinet, are permitted to be installed with only one locknut on the inside of the box. Guide card information from the UL *Guide Information for Electrical Equipment – The White Book* indicates that concentric and eccentric knockouts of all metal outlet boxes evaluated in accordance with UL.514A, *Metallic Outlet Boxes,* are suitable for bonding without the use of additional bonding equipment, such as bonding-type locknuts or bonding bushings. The guide card information further indicates that metal outlet boxes may be marked to indicate this condition of use.

13. Please provide discussion on Load Side Metering.

250.142(B) Load-Side Equipment. Except as permitted in 250.30(A)(1) and 250.32(B) Exception, a grounded circuit conductor shall not be used for grounding non–current-carrying metal parts of equipment on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means or the overcurrent devices for a separately derived system not having a main disconnecting means.

Exception No. 2: It shall be permissible to ground meter enclosures by connection to the grounded circuit conductor on the load side of the service disconnect where all of the following conditions apply:

(1) No service ground-fault protection is installed.

(2) All meter enclosures are located immediately adjacent to the service disconnecting means.

(3) The size of the grounded circuit conductor is not smaller than the size specified in Table 250.122 for equipment grounding conductors.

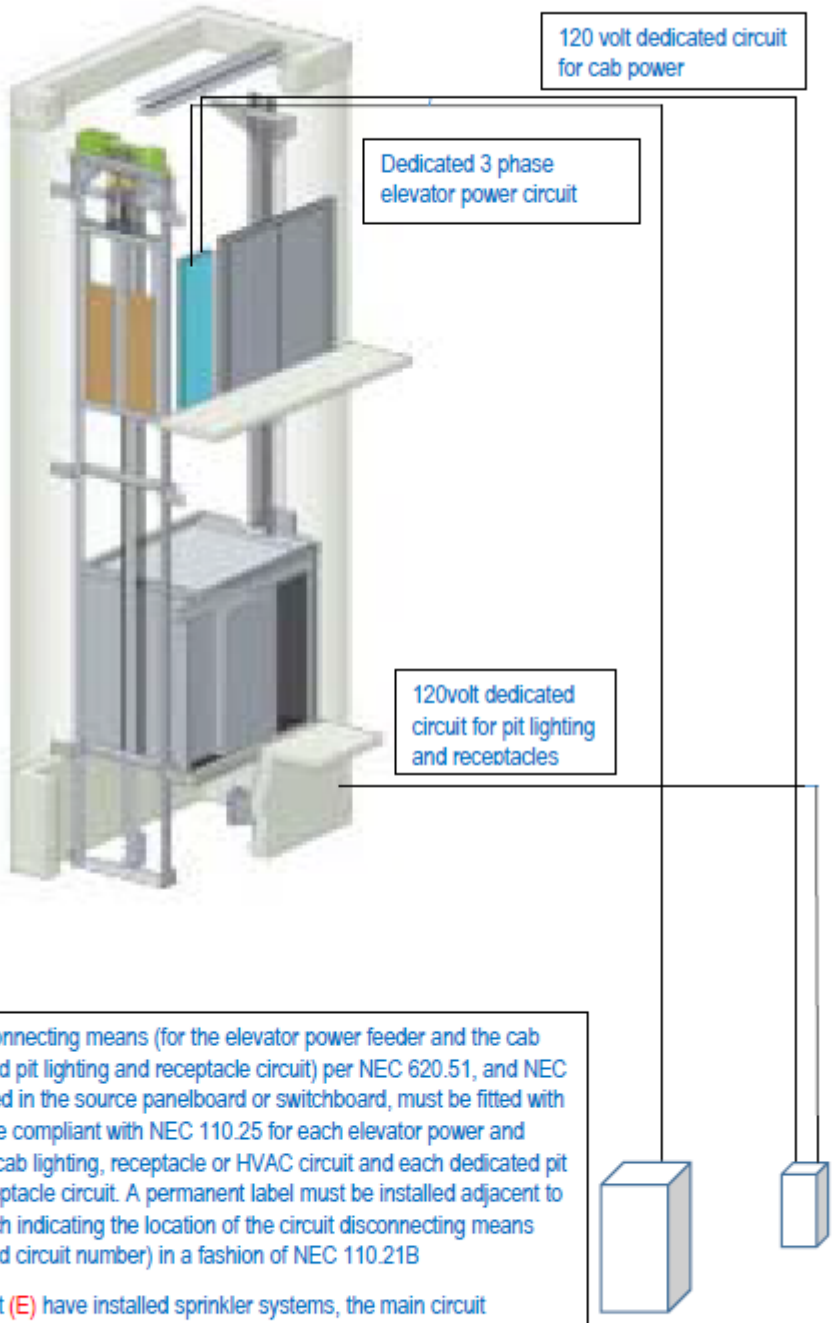
(G) Feeder Taps. Equipment grounding conductors run with feeder taps shall not be smaller than shown in Table 250.122 based on the rating of the overcurrent device ahead of the feeder but shall not be required to be larger than the tap conductors.

14. If the cab light disconnect cannot be located in the hoistway, can a breaker lock off be utilized in a panel room accessible to qualified persons only? NEC 620.53,

Otis Gen2 ® system design without separate machine room or space. Controller located in shaft at top landing, with quick access through door mullion for disconnection and service control. Lockable Disconnect for controller, located in access with lockable disconnect for separate cab 120volt circuit.

The Controller has additional separate disconnecting means for motor and driving system located in enclosure (C) within sight of driving means. (B)

No additional disconnecting means is required within the shaft, the location of the circuit disconnecting means (Room, panel and circuit number) must be permanently marked on the Controller disconnect (D) in a fashion per NEC 110.21B



The Circuit disconnecting means (for the elevator power feeder and the cab power circuit, and pit lighting and receptacle circuit) per NEC 620.51, and NEC 620.53,54 located in the source panelboard or switchboard, must be fitted with a lockable device compliant with NEC 110.25 for each elevator power and each dedicated cab lighting, receptacle or HVAC circuit and each dedicated pit lighting and receptacle circuit. A permanent label must be installed adjacent to the pit light switch indicating the location of the circuit disconnecting means (room, panel, and circuit number) in a fashion of NEC 110.21B

If hoist way or pit (E) have installed sprinkler systems, the main circuit disconnecting means shall be permitted to automatically open the power supply to the affected elevator(s) per NEC 620.51B

15. Is it permissible to encase conduits containing unfused conductors within CMU Blocks, per 230.6(2)

A. CMU by name and definition is Concrete Masonry Unit, to maintain the 2" requirements it may be necessary to grout the cells.

16. Is it permissible to terminate bonding jumpers for the grounding electrode system on listed multi-terminal lugs at each service location when more than one service is encountered? Interior or exterior of enclosures? Discuss

17. Is it permissible to support 1-1/2" conduit with a standoff strap suspended with ceiling wire? Would I need to continue the ceiling wire on down to the grid?

A. 300.11, Although there is not a maximum listed size of equipment allowed to be supported, practical application would limit to smaller than 1-1/2. However without code limits this may be allowed, but would be required to be installed with approved components and installation to be accepted.

18. I have a dog boarding facility being built, and it has a pool in the dog play area. It is classified as a fountain on the drawings, with no human use, but we know the dogs will be using it. Would this be considered a Swimming pool in the NEC?

A. We would consider that as a "fountain" and be installed per the requirements of Part 5 of article 680

19. Can I install occupancy sensors on my stairway lights in an apartment building? The lights have battery back-ups that are controlled by an automatic override relay.

Answer: Yes, the N.C. Building Code, section 1006 requires that stairways be illuminated at not less than one-foot candle and require that illumination to be extended for 90 minutes after the loss of normal power, by automatic means of storage batteries or on-site generator. The Energy Conservation Code allows for the use of occupancy sensors in stairways in section 505. See below exception to 210.70(A)(2)(1)

210.70 , Exception to (A)(2)(1), (A)(2)(2), and (A)(2)(3): In hallways, in stairways, and at outdoor entrances, remote, central, or automatic control of lighting shall be permitted.

20. I have a project with a generator that is not grounded as a separately derived system. The OCP for the generator is located remotely and my feeder is made-up of 10 rigid conduits, each with 3 – 600 MCM CU, ungrounded conductors. At the generator, I terminated my conduits with 4' of seal tight flex. The inspector said I need to bond the generator set. How do I size the grounding conductors in the paralleled conduits?

Answer: Those conductors are considered Supply-Side Bonding Jumpers. They would be sized according to 250.102(C) (2). This article refers you to Table 250.102(C) (1) for the conductor in each conduit, which would be a 1/0 CU. (Discussion)

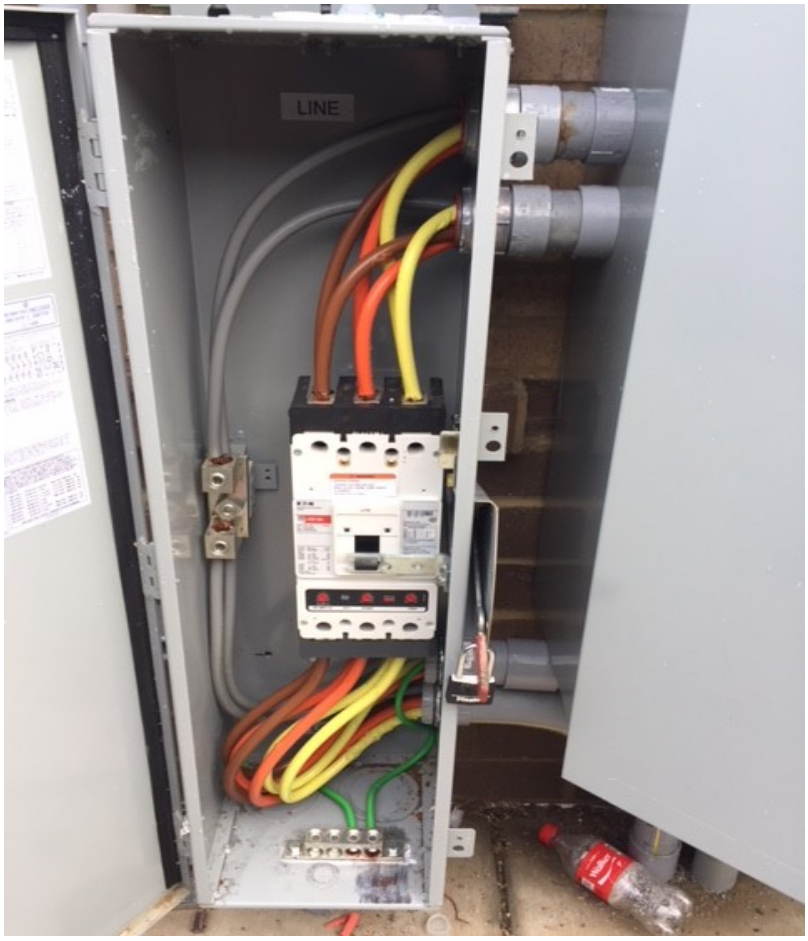
(B) Non-separately Derived System. If the generator is installed as a non-separately derived system, and overcurrent protection is not integral with the generator assembly, a supplyside bonding jumper shall be installed between the generator equipment grounding terminal and the equipment grounding terminal, bar, or bus of the disconnecting mean(s). It shall be sized in accordance with 250.102(C) based on the size of the conductors supplied by the generator.
The requirements of 250.35(B) create a return path for ground-fault current for permanently installed generators supplying a system that is not separately derived where the first system OCPD is not installed at the generator.
The conductor used to conduct ground-fault current between the first system disconnecting means and the generator is a supply-side bonding jumper, which is permitted to be a nonflexible metal raceway or a wire.
See also
250.102(C) for sizing of wire-type supply-side bonding jumpers

21. On new construction, is a Ufer ground required to be installed and inspected, to be part of the grounding electrode system?

Answer: N.C. amended article 250.50 to read as follows: All grounding electrodes as described in 250.52 (A) (1) through (A) (7) that are available at each building or structure served shall be bonded together to form the grounding electrode system. At one point in the construction process, the Ufer ground is available and must be inspected. The amendment only excludes existing buildings as stated in the exception that was added by N.C.

22. On new construction, if the Ufer ground was not inspected and the contractor poured the concrete, can the contractor now get an electrical engineer to sign-off on accepting the Ufer ground as part of the grounding electrode system?

23. Can equipment grounds be bonded to the grounded conductor and the grounding electrode conductor through the service disconnect can, as shown in the picture? Grounding Electrode Conductor is installed in the CT can.



Yes, 250.24 Grounding Service-Supplied Alternating-Current Systems, (B) Main Bonding Jumper. For a grounded system, an un-spliced bonding jumper shall be used to connect the equipment grounding conductor(s) and the service-disconnect enclosure to the grounded conductor within the enclosure for each service disconnect in accordance with 250.28. 250.28(A) Material. Main bonding jumpers and system bonding jumpers shall be of copper or other corrosion-resistant material. A main bonding jumper and a system bonding jumper shall be a wire, bus, screw or similar suitable conductor. A main bonding jumper must be installed between neutral bar and the ground bar on the bottom of the service equipment enclosure and sized according to table 250.102 (C) (1).

24. Is there a standard that a contractor can use to determine how large a bollard should be in a parking lot, to protect electrical equipment?

A. There is no standard given in the NEC, however the NCBC has section 1607.7.3 that refers to “Vehicle barrier systems”. It states that the barrier should be capable or resisting a 6000 lb. load at a height between 18” and 27”. Usually, the bollards are at least 36” high.

25. Can standard MC be used to supply power to light fixtures and switches outside of the patient care vicinity?

Yes. The 2017 Code gives you an option when grounding switches and light fixtures, outside of the 6' patient care vicinity or 7'-6" above the floor. You can either use an approved grounding path, as in 517.13(A) be it conduit or approved flex, or an insulated grounding conductor as in 517.13(B). The term, shall be permitted, is just telling you that you have an option, either (A) or (B), but it has to be one or the other. Basically, the code is now allowing the circuits for the lights and switched outside of the patient care vicinity, to be wired in MC.

26. I am changing out an existing interior sub-panel, currently fed from a three-wire feeder. To upgrade the feeder to a four wire, would require tearing out existing wall finishes. Am I required to change the feeder wire? Additionally, there is a washer inside the work space of the existing panel, can this be left as is or an I required to relocate the panel or the washer?

AMENDMENT 300.3(B)
Amend NEC 2017, page 134:
(5) Existing Dwelling Panelboards. An equipment grounding conductor for an existing one-and two-family dwelling shall be permitted to be installed separately and outside of the raceway or cable assembly where all the following conditions apply;
(a) When relocating or installing an additional service disconnecting means;
(b) Enacting 300.3(B)(5)(a) redefines the existing service entrance conductors as a feeder as set forth in Article 100; and
(c) Replacement of the existing service entrance conductors either requires the removal of the building finish or is deemed impractical by the authority having jurisdiction.

AMENDMENT 250.142(B)
Amend NEC 2017, page 126:
(B) Load-Side Equipment. Except as permitted in 250.30(A)(1) and 250.32(B) Exception, a grounded circuit conductor shall not be used for grounding non–current-carrying metal parts of equipment on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means or the overcurrent devices for a separately derived system not having a main disconnecting means.
Exception No. 1: The frames of ranges, wall-mounted ovens, counter-mounted cooking units, and clothes dryers under the conditions permitted for existing installations by 250.140 shall be permitted to be connected to the grounded circuit conductor.
Exception No. 2: It shall be permissible to ground meter enclosures by connection to the grounded circuit conductor on the load side of the service disconnect where all of the following conditions apply:
(1) No service ground-fault protection is installed.
(2) All meter enclosures are located immediately adjacent to the service disconnecting means.
(3) The size of the grounded circuit conductor is not smaller than the size specified in Table 250.122 for equipment grounding conductors.

Exception No. 3: Direct-current systems shall be permitted to be grounded on the load side of the disconnecting means or overcurrent device in accordance with 250.164.
Exception No. 4: Electrode-type boilers operating at over 1000 volts shall be grounded as required in 490.72(E)(1) and 490.74.

Exception No. 5: It shall be permissible to ground an existing panelboard enclosure by connection to the grounded circuit conductor for a one- and two-family dwelling where all the following conditions apply:
(1) When relocating or installing an additional main disconnecting means;
(2) Enacting 250.142(B) Exception No. 5: (1) redefines the existing service entrance conductors as a feeder as set forth in Article 100;
(3) An equipment grounding conductor in the existing panelboard is not present;
(4) Replacement of the existing service entrance conductors either requires the removal of the building finish or is deemed impractical by the authority having jurisdiction.
(5) All grounding electrode conductors are removed completely from the existing panelboard; and
(6) The grounded conductors are insulated by tape, heat-shrink, or other approved means except where covered by the sheathing of a cable assembly or as needed for joints, splices, and termination purposes.

27. I am installing an above ground pool, it is all plastic, with no electrical equipment attached. The pool pump is cord and plug connected, is it required to have an equipotential bond around the pool?
A. Is the installation permanent or is it a storable pool? Permanent is required to meet Article 680 parts 1 and 2, this includes Equipotential bonding found in 680.26. If the pool is 42 “deep or less it possibly can be considered a Storable pool and required to meet Article 680 parts 1, and 3, eliminating the EB.

28. I installed a AC unit changeout, on an existing residence, like-for-like. Am I required to install a service receptacle for the new unit?

29. I am replacing my kitchen cabinets and countertops, using the same design, footprint and configuration. Currently there is only 1 un-grounded receptacle above the countertops, if no electrical work is to be included, is it required to meet current code on receptacles above kitchen countertops.

30. Provide clarification on installation requirements for residential docks and piers.

31. When rooms are not defined on the stamped prints, is there minimum criteria to establish what a dining room is? (such as a table shown and room adjacent to kitchen)

There is nothing in the electrical code that gives us, either set requirements to determine a dining room, nor is there a requirement for a dining room, in a dwelling. However, the 2012 Residential Building Code does state that a dwelling must have a place for eating. So for now, to qualify as a dwelling, it is necessary to have a dining area. But, we have no criteria to determine which room is to be considered as dining, that is the responsibility of the designer. You can always request that the designer provide that information.

32. Can you please explain the differences between type 1 and 2 hoods? Additionally, is a Ansul system and shunt trip required on a type 2 hood?

A. Excerpt from NCMC

HOOD. An air intake device used to capture by entrapment, impingement, adhesion or similar means, grease, moisture, heat and similar contaminants before they enter a duct system.
Type I. A kitchen hood for collecting and removing grease vapors and smoke. Such hoods are equipped with a fire suppression system.
Type II. A general kitchen hood for collecting and removing steam, vapor, heat, odors and products of *combustion*.

33. Under the 2017 code, will tamper-resistant receptacles now be required for the passenger waiting/holding areas of airport?

A- No. Numbers 5,6 and 7 of article 406.12 was deleted by the NC amendments to the 2017 NEC

34. Is a disconnect means required for class 2 or 3 transformers such as used for doorbells, HVAC controls etc.?

A- No. The disconnecting means of Article 450.14 applies to “other than Class2 or Class 3 transformers”

35. I have some enclosures that are installed outdoors that contain receptacles. These enclosures are raintight. Is GFCI protection for the receptacles still required?

A. Yes, it would be unless either Exception 1 or 2 of 210.8(B)(4) was applicable.

36. Are disconnects required for LED fixtures that have double ended lamps?

A. No

37. Do the clearance requirements of 110.26 apply to Fire alarm panels?

38. Can TC cable be used in multi-family dwelling without being in a raceway or cable tray like you can in one and two-family dwellings?

A- No. And only Type TC-ER cable containing both power and control conductors that are identified for pulling through structural members (marked "JP") are permitted in one and two-family dwelling units per 336.10(9)

III. Open Discussion

Paige Sign Cables, and Manufacturers Installation Guidelines